CLAIMS:

1. An isolated bacterium that has a greater than 75% reduction in hydrogenase activity relative to a wild type strain.

2. The isolated bacterium of claim 1 wherein the strain comprises a mutation of a NiFe hydrogenase gene, wherein the mutation disrupts the encoded NiFe hydrogenase enzyme's ability to oxidize H_2.

3. The isolated bacterium of claim 2 wherein the strain comprises a mutation to each of the NiFe hydrogenase genes present in the genome of the strain, wherein the mutations prevent the expression of a functional NiFe hydrogenase protein.

4. The isolated bacterium of claim 1 wherein the strain is incapable of expressing a functional NiFe hydrogenase protein.

5. The isolated bacterium of claim 1 wherein the bacterium selected from the group consisting of *Salmonella, Helicobacter , E. coli, Shigella, and Campylobacter.*

6. The isolated bacterium of claim 3 wherein the bacterium is selected from the group consisting of *Salmonella typhimurium, Salmonella typhi, E. coli 0157, Shigella flexneri, Shingella sonnei, and Campylobacter jejuni.*

7. An antigenic composition comprising an isolated bacterium of claim 3 and a pharmaceutically acceptable carrier.

8. The antigenic composition of claim 7 further comprising an adjuvant.

9. The antigenic composition of any of claims 7 wherein the pharmaceutically acceptable carrier comprises water.

10. The antigenic composition of claim 7 in the form of a frozen or lyophilized powder.

11. A method of inducing an immune response in a mammal against a pathogenic bacterium said method comprising the step of

administering to said mammal a composition comprising live bacterium, wherein the bacterium has been modified to prevent the expression of a functional NiFe hydrogenase protein.

12. The method of claim 11 wherein the bacterium is selected from the group consisting of *Salmonella typhimurium, Salmonella typhi, Helicobacter hepaticus, E. coli 0157, Shigella flexneri, Shingella sonnei, and Campylobacter jejuni.*

13. The method of claim 12 wherein the modification comprises a mutation to each of the NiFe hydrogenase genes present in the genome of the bacterium

14. A method of protecting a mammalian species against an infection with pathogenic *Salmonella, E. coli, Shigella,* or *Campylobacter*, said method comprising the step of administering to the subject a live bacterium, selected from the group consisting of *Salmonella, E. coli, Shigella, and Campylobacter*, wherein the bacterium has been modified to prevent expression of a functional NiFe hydrogenase protein.

15. The method of claim 14 wherein the live modified bacterium is administered orally at a dose of about 10^4 to about 10^8 cfu.

16. The method of claim 14 wherein the modification comprises a deletion mutation to each of the NiFe hydrogenase genes present in the genome of the bacterium.

17. The method of claim 16 wherein the mammalian species is protected from a *Salmonella* infection, said method comprising administering live *Salmonella* wherein each of the NiFe hydrogenase genes present in the genome of the bacterium has been mutated to prevent expression of a functional NiFe hydrogenase protein.